Delaware
Economic Development

Process for forming multilayer articles by melt extrusion

Description of Technology: Multilayer articles, particularly multilayer articles having electrical or ionic conductivity, are made using an improved melt extrusion process. The process includes a combination step in which a macroscopically homogeneous mass is formed prior to introduction into an extruder. The multilayer article may include an electrode layer and a separator layer that are extruded onto a metal current collector. Such structures are particularly useful in lithium-ion batteries.

Patent Listing:

1. **US Patent No.** 6,503,432**,** Issued on January 7, 2003, "Process for forming multilayer articles by melt extrusion"

http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=6,503,432.PN.&OS=PN/6,503,432&RS=PN/6,503,432

Market Potential: A battery can be made of one or more cells, usually connected to achieve a particular voltage and/or capacity. A cell includes three major components: the positive electrode, the negative electrode, and an electrolyte. A porous, polyolefin-based separator is also commonly present to prevent electrical contact between the two electrodes. In practice, a cell often also contains anode and cathode current collectors which are conductive layers, usually metallic, each of which will have tabs for external connection. A battery often also requires a package which may contain several individual cells and out of which the tabs will protrude.

Melt processes, particularly melt extrusion processes, offer lower investment and higher capital productivity as compared with solvent coating processes. Multilayer extrusion processes offer the additional advantage of fewer process steps and further increased productivity.

On the other hand, a disadvantage to extrusion, as practiced in the existing art, is the requirement of melting the polymer at relatively high temperatures, making it difficult to process any volatile liquids or thermally unstable materials. Another disadvantage to extrusion as practiced in the existing art, is that mixing is carried out in the molten state; imposing high shear stresses on the mixtures. This can cause degradation of some of the desired properties of the composition.

Therefore, there is a need for an improved multilayer extrusion process which is suitable for materials sensitive to heat and/or shear stress.

Benefits:

- Improved multilayer extrusion process which is suitable for materials sensitive to heat and/or shear stress

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Applications:

- Lithium-ion batteries

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